MONDAY, MAY 28TH, 1855.

THOMAS ROMNEY ROBINSON, D. D., PRESIDENT, in the Chair.

DR. ALDRIDGE read a paper on the nature of the precipitate which occurs in the preparation of alkaline phosphates.

"The composition of the precipitate produced by the addition of the carbonate of potash, soda, or ammonia, to the acid liquor made by digesting dilute sulphuric acid upon bone ashes, does not seem to have been very carefully studied by chemists.

"M. Dumas considers this precipitate to be carbonate of lime. He says in his 'Traité de Chimie appliquée aux Arts,' tome ii. p. 318:—'On l'obtient en versant, dans une dissolution de phosphate acide de chaux du carbonate de soude en dissolution, jusqu' á ce que la liqueur soit alcaline; ce qui donne lieu à un dégagement d'acide carbonique et à *un précipité gélatineux de carbonate calcaire*.' In this statement he is followed by Sir Robert Kane and the majority of British compilers. Berzelius regarded it as a mixture of phosphate of lime and a little carbonate. He says in his 'Traité de Chimie,'seconde édition, Française, 1847, tome iii. p. 214:—'La liqueur acide, qui contient de l'acide phosphorique, du phosphate calcique et un peu de gypse, est décomposée par le carbonate sodique, de manière qu'il se précipite du *phosphate calcique, mêlé avec un peu de carbonate*, tandis que le phosphate sodique, accompagné d'une petite quantité de sulfate, reste en dissolution dans la liqueur.' Gmelin considers it to be phosphate of lime and magnesia. In the translation of his 'Hand-Book,' published by the Cavendish Society, 1849, vol. iii. p. 91, it is said, speaking of the ordinary phosphate of soda:—'It may be prepared by adding carbonate of soda to the aqueous phosphoric acid obtained from bone ash, the liquid being kept at a boiling

temperature, and the carbonate of soda added as long as effervescence continues; filtering to separate phosphate of lime and magnesia, boiling the liquid down, and leaving it to crystallize.'

"I will not occupy the time of the Academy by proving that the assertion, that this precipitate is carbonate of lime is utterly erroneous; the most trifling examination shows that it is a phosphate of lime of some kind. Berzelius and Gmelin thought, as is evident from the extracts quoted, that it was identical with bone earth, for they never apply the simple name of 'phosphate of lime' to any other compound; and they were probably led to this opinion by the knowledge of the fact, that when bone earth is dissolved by nitric, hydrochloric, or acetic acids, it is precipitated by an alkali unchanged. This is easily intelligible by an equation:

$$PO_5\ 3\,Ca\,O + 2\,Ch\,H = PO_5\ Ca\,O\ 2\,HO + 2\,Ca\,Ch.$$

It will be here seen, that a mono-phosphate of lime and chloride of calcium are formed (supposing hydrochloric to be the acid employed), and both these dissolve. Let an alkali (ammonia) be now added, and the following will take place:

$$PO_5\ Ca\,O\ 2\,HO + 2\,Ca\,Ch + 2\,NH_3 = PO_5\ 3\,Ca\,O + 2\,NH_4\ Ch.$$

The two equivalents of lime which had been abstracted and decomposed by the hydrochloric acid are re-formed, and, going back to the mono-phosphate, regenerate bone earth.

"But it will be seen that this reproduction of the bone-earth is due to the whole of the lime being retained in the solution; the case is different when sulphuric acid acts upon bone ashes. Döbereiner and Berzelius have shown that the action of sulphuric acid on bone earth varies according to the quantity of acid employed; but in any case the lime subtracted by the acid is rendered insoluble, and thus removed from the liquid. A possible decomposition is the following:

$$2\,(PO_5\,3\,Ca\,O) + 5\,SO_3\,5\,HO = PO_5\,3\,HO + PO_5\,Ca\,O\,2\,HO + 5\,(SO_3\,Ca\,O),$$

and the results would be free phosphoric acid, mono-phosphate of lime, and sulphate of lime; but the latter is insoluble, or nearly so, and the filtered liquid would therefore only contain phosphoric acid and mono-phosphate of lime. If to this solution, ammonia or any other alkali were added, the most probable reaction might be thus represented:

$$PO_5\,3\,HO + PO_5\,Ca\,O\,2\,HO + 4\,NH_3 = PO_5 + 2\,NH_4\,O + HO + PO_5\,Ca\,O\,2\,NH_4\,O.$$

The free phosphoric acid would form the ordinary phosphate of ammonia, and the mono-phosphate would, by appropriating two equivalents of ammonia, become an ammonio-phosphate of lime. I say this would be the most likely decomposition, because, in the absence of the two equivalents of lime requisite to make bone earth, the mono-phosphate might be supposed to prefer oxide of ammonium to water, the only other available basic element.

"By digesting dilute phosphoric acid upon bone ashes, and filtering, I obtained a solution of mono-phosphate of lime with free phosphoric acid. This solution precipitated upon the addition of an alkali; but the precipitate differed from bone earth by being easily fusible before the blow-pipe flame.

"Saussure says, that bone earth fuses at 370° Wedgwood, but I never could produce the slightest cohesive effect on it by subjecting it to a gas jet urged by the blow-pipe. The fusible precipitate thrown down by an alkali from an acid solution of the mono-phosphate differs in properties according to the alkali employed.

"When precipitated by ammonia it fuses into a transparent glass bead in the outer flame, and bubbles violently; it becomes white and opaque when kept long in the inner flame; in fact, it acts exactly similar to metaphosphate of lime, which no doubt it is, the ammonia being driven off by the heat. The

precipitate produced by potash, or carbonate of potash, is also fusible; but the bead is white and opaque, both in the outer and inner flames; it does not bubble, and the flame becomes coloured strongly violet. The precipitate caused by soda resembles that produced by potash in its behaviour before the blow-pipe, with the exception that the colour of the flame is the characteristic yellow proper to soda compounds. I think there can be very little doubt but that these are double salts.

"Upon adding the alkalies, or their carbonates, to the acid liquid produced by digesting diluted sulphuric acid upon bone ashes, exactly similar precipitates are thrown down. These are all fusible, and as the beads possess precisely similar characters to those I have described, I need not now repeat them. If the liquids are mixed cold, after the sediment has been removed by deposition or filtration, a further precipitation will happen upon boiling in the case of alkaline carbonates, but this second precipitate behaves before the blow-pipe in a similar manner to the first.

"In conclusion, I submit to the Academy, that the precipitate that occurs in the preparation of alkaline phosphates is not, as has been hitherto stated, carbonate of lime, or phosphate of lime, but is a double phosphate of lime and of the alkali employed."

Dr. Anster read a Paper by the Rev. James Wills on the subject of Dreams.

After some general observations on the peculiar difficulties of the subject, the author proceeded to give a conjectural statement respecting the probable origin of dreams, founded on the received theory of the nervous system.

He then entered into some explanations, in which he traced the mental operations in dreaming, to the laws of association, as stated in his former Papers.

The author next proceeded to explain two conditions by which the peculiar character and direction of these operations